



# TEACHER GUIDE

## BRAIN PROCESSING OF SENSES GRADES 3-5

### COMMON MISCONCEPTIONS

- **Humans are not animals.**  
Humans are animals, and are classified as a type of animal called a mammal. Each type of animal has its own characteristics that make it unique.
- **All animals have the same kinds of senses.**  
There is a very wide variety of senses in the animal world. Each animal has their own specific kinds of senses that are modified for that animal to survive and thrive in their environment.
- **All animals use similar body parts, or sense organs, to detect similar or the same stimuli.**  
Animals may have a similar-seeming sense organ as another animal, but that sense organ may function very differently. For instance, the tongue of a snake is its smell sense, and the tongue of a person is their taste sense.
- **Instinctive reactions and learned reactions work the same way in an animal.**  
Instinctive reactions are programmed into an animal's nervous system at birth, allowing that animal to react to stimuli without having to think of a response. Learned reactions require an animal to consciously make a response and often entail the need to choose which response to make.

### BRAIN

The human brain is the command center for the human nervous system. It receives input from the sensory organs and sends output to the muscles. The human brain has the same basic structure as other mammal brains, but is larger in relation to body size than any other brains.

The largest part of the human brain is the cerebrum, which is divided into two hemispheres - the left and right hemispheres - connected by nerves called the corpus callosum. The outermost layer of the cerebrum is the cerebral cortex, which consists of four lobes: the frontal lobe, the parietal lobe, the temporal lobe, and the occipital lobe. Underneath the cerebrum lies the brainstem, and behind that sits the cerebellum. Each area of the brain is associated with specific senses and body functions.

## SENSES

The five traditional senses are taste, smell, touch, hearing, and sight. When a sense is stimulated, specialized cells and tissues within each sense organ receive raw stimuli and translate it into signals that nerves then relay to the brain. Specific areas in the brain interpret the signals as sight (vision), sound (hearing), smell (olfaction), taste (gustation), and touch (tactile perception).

## SENSORY RECEPTORS

One of the characteristics of a living organism is its ability to respond to stimuli. The human sensory system is highly evolved and processes thousands of incoming messages simultaneously. This complexity allows you to be aware of your surroundings and take appropriate actions.

Incoming messages are detected by sensory receptors, structures in your body that react to an internal or external physical stimulus in the environment. Sensory receptors can be classified by the type of stimulus that generates a response in the receptor. Broadly, sensory receptors respond to one of four primary stimuli: chemicals (chemoreceptors), temperature (thermoreceptors), pressure (mechanoreceptors), and light (photoreceptors).

## INSTINCTIVE RESPONSES VS. REFLEX VS. LEARNING

Instinct is an unvarying behavior that is typical of a particular species. Instinctive behaviors and responses are present and complete within the individual at birth. Animals employ formalized, rigid sequences of action in response to specific stimuli called fixed-action patterns of behavior, or FAPs. This is one characteristic of instinct - the creature acting on instinct is not thinking about what it does, but is behaving almost as though it were controlled by some outside force. Closely tied to instinct is the innate animal behavior known as a reflex: a simple, inborn, automatic response to a stimulus by a part of an organism's body. In contrast, learning is the alteration of behavior as the result of experience. Distinguishing between instinct and learning revolves around the question of whether an animal's action is based on experience or instead is guided by instincts "hardwired" within its brain, when responding to a specific situation.

## REACTION TIME

Reaction time is a measure of how quickly an organism responds to some sort of stimulus. Even though stimuli—or changes in your environment that you react to—travel very quickly along your nervous system as messages, your body doesn't react instantly. Many athletes spend hours practicing to improve their reaction time. Reflexes and reactions, while seeming similar, are quite different. Reflexes are involuntary, used to protect the body, and are faster than a reaction. Reflexes are usually a negative feedback loop and act to help return the body to its normal functioning stability, or homeostasis. Reactions are a voluntary response to stimuli.

